

## Special Requirements of Railroad Companies

In almost all cases the agreement between the State and the railroad company for the construction of a railroad underpass (a structure carrying railroad tracks over a highway) provides that upon completion of construction the State will maintain the substructure (piers and abutments up to the bridge seats) and the railroad company will maintain the superstructure. In view of their responsibility in connection with such maintenance, the following railroad companies have certain special requirements and preferences which must be observed in connection with the design and construction of underpass superstructures carrying their tracks.

Most Railroads in California have the following requirements:

1. The length of cover plates shall be determined either by using a rigorously correct moment diagram or in accordance with the procedure set forth in *Structural Design*, by Southerland and Bowman, page 136, which states "the required length of a cover plate may be obtained from the following equation."

$$L' = L(0.1 + 0.9\sqrt{\alpha / A})$$

Notations:

L = Length of span

a = Area of cover plate in question + cover plates outside

A = Total flange area

$$\left( \text{cover plates} + \text{angles} + \frac{\text{web}}{8} \right) \text{ at centerline span}$$

L' = Length of cover plate

2. Ballast troughs of all railroad bridges should be sloped a minimum of 1% for drainage. A greater slope, if practical, is desired. If the tracks are level, the depth of ballast can be varied. This will increase the vertical dimension from top of rail to bottom of superstructure and should be considered in determining vertical clearances.

Most Railroads in California have the following preferences:

1. Abutment stems should be 0.2H in thickness at the base.
2. Columns should be 0.2H in thickness at the base.
3. Floor beams should be 21" or more in depth.

Supersedes Memo to Designers 17-120 dated December 1989

Southern Pacific Transportation Company  
San Diego and Arizona Eastern Railway Company  
Holton Interurban Railway Company

1. Ballast plates on underpasses carrying their tracks shall be low-alloy, corrosion-resistant structural steel conforming to the requirements of the Specifications of the American Society for Testing Materials, Serial Designation A-242.
2. Pins for bearings shall be 3" in diameter or more.
3. The toe of slope of earth fill approaches to highway overpass structures shall be so located that the railroad can maintain its standard roadway ditch section, the outer limit of which is 15 feet from the centerline of track.
4. No new bridges of the trough girder or through truss design will be constructed except in unusual circumstances where a deck-type structure cannot be used.
5. Working area for coupling cars shall be provided on all reconstructed and new bridges regardless of their location. A ballast trough with a minimum width of 8'-0" from centerline on tangent track and 9'-0" on curved track will provide this working area and facilitate the removal of ties.
6. Clearance from centerline of track on inside edge of widest cover plate should be shown on the General Plan. Minimum clearance requirements are 9'-0" from centerline of track to inside of widest cover plate on the top girder flange for tangent track and 10'-0" for curved track.
7. Knee braces for through plate girder bridges should not be less than 2'-6" wide at the top of the floor beam.
8. The minimum thickness of concrete deck slabs shall be 5½" over top of floor beams for spans of approximately 2'-0" center-to-center of floor beams.
9. All structures shall be designed for Cooper's E-80 loading. Lighter design loading will be considered only in rare instances, such as special purpose spur tracks.
10. Special duct patterns are required for locating prestressed tendons. See special details illustrated in Memo to Designers 17-140.
11. See *Bridge Design Details* manual, page 12-73, for reinforced or prestressed concrete through girder bridge dimensions.
12. Railroad Underpasses in populated areas should have 1" mesh chain link fabric fencing extending to 8 ft. above the walking surface to prevent ballast rock from falling or being thrown onto traffic under the structure.
13. Utilities shall not be installed on underpass structures.

The Atchison, Topeka and Santa Fe Railway Company

1. All steel in the superstructure of underpasses carrying their tracks except steel in hand rails and other minor details shall be "copper bearing" steel and shall be noted on the plans as such. In order to be considered "copper bearing", the steel must contain not less than 0.2 percent of copper.
2. The protective covering to be provided over membrane waterproofing on the superstructures of underpasses carrying their tracks shall be asphalt plank.



3. The back surfaces of abutments shall be damp-proofed with either asphalt or coal-tar emulsions. For the method of application and general requirements of these bituminous emulsions, refer to the AREA Specifications. A strip of waterproofing shall also be placed at the junction of the stem and the footing.
4. Longitudinal decks for ballast troughs shall be constructed to a slope of not less than 0.04" per foot.
5. Walkway plates shall be no less than  $\frac{5}{16}$ " thick.
6. Alemite fittings shall be used on all large bearings.
7. Access ladders shall be provided for the inspection of abutment bearings.
8. All structures shall be designed for Cooper's E-80 loading with diesel impact.
9. All structures over Santa Fe tracks having less than 15 feet clearance from substructure to centerline of tracks shall have column with a minimum area equivalent to a 4-foot circular concrete column.
10. Inside guard rail is required for railroad structures. Check with the Agreements Section for the applicable railroad standard drawing.

Union Pacific Railroad Company  
Western Pacific Railroad Company  
Sacramento Northern Railway  
Tidewater Southern Railway Company

1. All bridges which are to carry Union Pacific main line traffic shall be designed for Cooper's E-80 Loading.
2. Inside guard rail is required for railroad structures. Check with the Agreements Section for the applicable railroad standard drawing.

  
Floyd L. Mellon

  
Jerry A. McKee

JGS:tr